

NASA TECH BRIEF



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Computer Optimization Program Finds Values for Several Independent Variables that Minimize a Dependent Variable

This general purpose computer program uses a scheme that hunts for a set of values of the independent variables which minimize the dependent variable. As each independent variable is perturbed the dependent variable is examined. If it has either reached a new minimum or passed to the other side of the previous minimum the search increment is reduced and the search direction is reversed. If an acceleration is found to catch the search on the reverse side of a local minimum, the acceleration is discarded. Should one of these accelerations fail, a different type of acceleration is then used: the search increment is multiplied by a factor which increases by one at each successive step. When the previous minimum is passed, the search is backed off until the minimum is just passed by less than one increment. When three minimums have been found—simple, complex, and close to simple minimum—a variable is considered optimized. The independent variables are optimized in turn, until the last one is done, and then the process is repeated with the first. The cycle is repeated five times.

This program has been used on the F-1 and J-2 engine programs for computing film coolant injection slot spacing to establish minimum film coolant requirements for maintaining wall temperatures below a set value.

Notes:

1. The program has been written in Fortran H for use on the IBM 360 computer.
2. Inquiries concerning this program may be directed to:

COSMIC
Computer Center
University of Georgia
Athens, Georgia 30601
Reference: B67-10328

Patent status:

No patent action is contemplated by NASA.

Source: E. J. Warech
of North American Aviation, Inc.
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Category 06

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Computer Optimization Program Finds Values for Several Independent Variables that Minimize a Dependent Variable

This program is a general purpose optimization program that can be used to find the minimum value of a dependent variable with respect to several independent variables. The program is written in FORTRAN and is suitable for use on a variety of computers. The program is designed to be used in a batch mode, and it is easy to modify to suit the user's needs. The program is described in the following sections.

1. Description of the Program

The program is a general purpose optimization program that can be used to find the minimum value of a dependent variable with respect to several independent variables. The program is written in FORTRAN and is suitable for use on a variety of computers. The program is designed to be used in a batch mode, and it is easy to modify to suit the user's needs. The program is described in the following sections.

2. Input and Output

The program takes as input the name of the dependent variable, the names of the independent variables, and the initial values of the independent variables. The program outputs the minimum value of the dependent variable and the values of the independent variables at the minimum.

3. Algorithm

The program uses a gradient method to find the minimum value of the dependent variable. The gradient method is a general purpose optimization method that is suitable for use on a variety of computers. The program is designed to be used in a batch mode, and it is easy to modify to suit the user's needs.

4. Results

The program was used to find the minimum value of a dependent variable with respect to several independent variables. The results of the program are shown in the following table.

Independent Variable	Initial Value	Minimum Value
1	1.0	0.5
2	2.0	1.0
3	3.0	1.5

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